Critical appraisal of methodological quality of Systematic Reviews and Meta-analysis in Paediatric Dentistry journals

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Abstract

Objective. To systematically assess the methodological quality of Systematic Reviews (SRs) and Meta-Analyses (MA) published in Paediatric Dentistry journals and to analyze the relationship between the authors, journals, country, review topic and the year of publication to the methodological quality of SRs and MA. **Design.** Paediatric Dentistry journals ranked in the top five of the *h5* index of Google Scholar Metrics were selected. SRs with MA were searched independently by two reviewers using PubMed and Scopus databases until December 2017. Methodological quality was assessed using A Measurement Tool to Assess Systematic Reviews (AMSTAR) tool. Statistical significance was set at $p<0.05$ and Mann-Whitney U test and Kruskal-Wallis test was employed for comparing the AMSTAR score with the journal characteristics. **Results.** Finally, 24 SRs with MA were included. The overall AMSTAR score of SRs and MA published in paediatric dentistry journals was 7.08 ± 2.41. No statistically significant differences were found between the country, journal or focus of study to the quality of SRs except the number of authors and the year of publication ($p<0.05$). **Conclusions.** The quality of SRs and MA in leading Paediatric Dentistry journals were evaluated with AMSTAR tool and areas where quality could be improved were identified.

Key words. Systematic Review; Meta-Analysis; Paediatric Dentistry; Methodological Quality; AMSTAR

Introduction

Systematic reviews (SRs) provide the highest level of evidence by employing rigorous methodology in identifying and collating information from the published, and ideally the unpublished, literature[1]. They summarize medical reports on a specific clinical question, using explicit methods to search, critically appraise, synthesize and report the world literature systematically[2]. This approach allows a more complete picture of a particular area to be presented. Narrative review provides little clarity about the selection, and analyses, of the primary studies, thereby not allowing readers to assess potential bias in the review process and the literature presented[3]. SR can also lead to meta-analysis (MA) in which data from individual studies are pooled quantitatively and reanalyzed using established statistical methods[2].

SRs and MA provide answers to pertinent clinical issues and contribute to the evidence-based decision making process. A poor quality SR can provide misleading conclusions that might affect decisions and consequently the quality of care for the patients. Assessing the quality of SRs and MA is an important part of identifying any shortcomings and considering recommendations for improvement[1,2]. However, even with rigorous process to distill the evidence and allow a rational approach to appraising it, clinicians are presented with the problem of the sheer volume and variable quality of SRs that are published. There has been an exponential rise in the number of SRs and MA published in recent years. A simple search using the terms (("systematic review") OR ("meta-analysis")) AND dentistry in the National library of Medicine database retrieves around 6054 articles dedicated to SRs and MA (NIH-NLM)[4]. Although many SRs and MA reach the stage of publication in the literature, their quality has been questioned. One study that evaluated the quality of SRs published in the area of oral health found the overall quality of the articles to be

poor[5]. A recent study also reported discrepancies within the published literature and found substantial room for improvement within all aspects of SRs reporting and methodology with the authors advising caution when interpreting the results of SRs and MA[6].

In 1991, a validated tool to measure the quality of the SR, the "Overview Quality Assessment Questionnaire (OQAQ)" was developed[7]. Further modifications to the questionnaire were made to include additional items and a new Measurement Tool to Assess Systematic Reviews (AMSTAR) was developed consisting of 11 items and showing good validity[8]. AMSTAR has been used in assessing the methodological quality of SR and MA published in various specialities in dentistry including; Periodontics[9], Orthodontics[10,11] and Endodontics[12]. The above studies have shown that SRs published in the respective specialty journals were low to medium quality. In 2014, the methodological quality of SRs in the area of paediatric oral health was published in the Cochrane Oral Health Group and was assessed using AMSTAR. The Cochrane reviews were scored as being of high quality[13]. Increasing numbers of SR and MA are being published in Paediatric Dentistry journals and in the current era of evidence based dentistry, it is imperative to evaluate their quality of SR and MA. It is our understanding that no such work has been conducted to date. Hence, the objectives of the current review were, firstly, to assess the methodological quality of SR and MA published in Paediatric Dentistry journals and secondly, to analyse the relationship between the authors, journals, country, focus of study, year of publication and the number of times that the SR and MA were cited (number of citations) to the methodological quality of SR and MA.

Materials and Methods

Literature Search

Paediatric dentistry journals ranked in the top five of the *h5* index of Google Scholar Metrics were selected for identifying eligible SR with MA[14]. The search was carried out in PubMed and Scopus for articles published before the end of December 2017. The search terms used in PubMed and Scopus were: "Selected Journal Name" AND ((systematic review) OR meta-analysis). The bibliographies of each of the included SRs were searched for eligible studies. In addition to the databases, individual journal websites and the references of the selected articles were hand searched to identify other relevant articles.

Inclusion and exclusion criteria

SRs with MA published in the selected Paediatric dentistry journals (all English language), on any topic. Studies were excluded where there was no associated MA.

Study selection and data extraction process

Study selection, based on the eligibility criteria, was carried out independently and in duplicate by two reviewers (JJ and VK) with resolution of any disagreement resolved through discussion with a third reviewer (SJ). Data extraction was performed independently by JJ and VN on a piloted data extraction form and any disagreement was arbitrated by SJ. Data extracted included: first author name, number of authors, country of the first author, study design, focus of the study, year published, and name of the journal. The number of citations of the selected SRs and MA were obtained from the Google Scholar Metrics database[14].

Methodological Quality appraisal

The methodological quality of the selected SRs was assessed using AMSTAR. The tool has good face and content validity and consists of 11 items of equal weights. A maximum score of one could be assigned to each item and a SR could obtain a score of between 0 and 11. Inadequate or absent reporting of any item in the SR was scored as zero[15]. Where there was missing or unclear data, the authors of the SR were contacted for clarification. The final scores of each SR were also sent to the respective authors for any clarification. Acceptance of any clarification on the AMSTAR score from the individual authors of the SR was decided by JJ and VK with arbitration by SJ if required. Agreement between the two independent reviewers (JJ and VK) in scoring the SRs by AMSTAR was calculated by Cohen's kappa analysis.

Statistical analysis

Data were analysed using IBM SPSS statistics software 23.0 Version (Armonk, NY, USA). To describe the data descriptive statistics, frequency analysis and percentages were used for categorical variables and mean and standard deviation (SD) for continuous variables. Following assessment of normality of the data, the median AMSTAR score for each characteristic, including the number of authors, country, study focus, journal, publication year and number of citations, were analysed using Kruskal-Wallis test. In addition to this, for characteristics with significant differences, Mann-Whitney U test was employed to test the difference between two variables within each characteristic. Bonferroni correction was performed for pairwise comparisons using Mann-Whitney U test. In all the above statistical tools, the probability value 0.05 was taken as the level of statistical significance.

Results

Study characteristics

The five journals identified from the h5-index of Google Scholar Metrics were; *International Journal of Paediatric Dentistry* (IJPD), *Pediatric Dentistry* (PD), *European Archives of Paediatric Dentistry* (EAPD), *European Journal of Paediatric Dentistry* (EJPD) and *Journal of Clinical Pediatric Dentistry* (JCPD). The search details are summarized in Fig. 1. The initial search identified 3004 publications (Appendix 1), whilst 721 were excluded as duplicates. Furthermore, 2231 articles were excluded in title and abstract screening. Full text retrieval was limited to 52 publications out of which 28 (Appendix 2) were excluded due to absence of MA. Final selection identified 24 SRs with MA[16-39]. The characteristics of the SRs with MA are presented in Table 1. The numbers of SRs by journal were; IJPD n=10, PD n= 6, EAPD n=3, EJPD n= 3 and JCPD n= 2 and the SRs were published between the years 2010 and 2017. The number of authors of the SRs ranged from 2-17 with mean of 5.66 ± 3.33. The primary countries of the first authors were South America (37.5%), North America (25 %), Europe (16.6 %), and others (20.8%) Amongst the study topics in Paediatric Dentistry, most of the SRs focused on preventive strategies (37.5 %) followed by restorative procedures (16.6 %), pediatric endodontic procedures (16.6 %) and behavior management aspects (16.6 %). On contacting the authors on the scores, eight out of 24 authors responded[19,25,28,30,31,34,36,38]. Three authors agreed to the scores and five authors provided justification for changes in the scores. Following deliberation of the responses, scores had been modified in Item 1 (*priori* design) in two studies[19,34], Item 10 (Publication Bias) in one study[30] and Item 11 (Conflict of interest) in two studies[30,31]. The revised score was confirmed again with the corresponding author of the SRs.

Examiner reliability scores for AMSTAR

For AMSTAR items, the inter-examiner reliability between the reviewers (JJ and VN) was assessed using Kappa analysis and the score was 0.98 ($p<0.001$) equating to "almost perfect" agreement[40].

Methodological quality assessment using AMSTAR

The AMSTAR scores on the methodological quality of selected SRs are presented visually in Table 2 as a heat map to represent the dichotomous scoring of "0" and "1". The percentage of adequately reported individual items in the AMSTAR tool is presented in Fig. 2. Out of 24 studies included in the analysis, three SRs scored 10 or higher, 12 scored between 7 and 9, and 9 scored 6 or below; the maximum score was 11 if all AMSTAR items were met. The mean overall AMSTAR score of included SRs was 7.08 ± 2.41.

Association between methodological quality and: authors; journal; country; focus of study; year of publication; and the number of citations of the selected SR and MA.

The median, quartiles, mean and standard deviation of the characteristics (authors, journals, country, focus of study and year of publication) are presented in Table 3. Articles published from South America showed relatively better score (8.33±1.44) than other countries. Amongst the journals, *PD* scored higher (8.33±3.45) than the other journals, as did articles published in the area of Restorative Dentistry (8.00±2.16). However, no statistically significant differences were found between the country, journal or focus of study and the quality of SRs ($p>0.05$). A significant difference was observed between the number of authors and the SRs' quality with studies containing more than 6 or 7 authors (8.83 ± 1.83) achieving a higher score ($p=0.028$). Within the

number of authors, statistically significant differences were observed between 2, 3 authors compared to 4, 5 (p=0.009) and 6,7 (p=0.005) and more than 7 authors (p=0.017). A steady increase was observed in the SRs published in the field of Paediatric Dentistry from 2010 to 2017. The SRs published in 2016-2017 showed better methodological quality, with a mean score of 8.40 ± 1.54 compared to those published in 2010-2013 (5.75 ± 1.26) and 2014-2015 (4.2 ± 2.28) respectively (p=0.002). A significant difference was observed in the studies published in 2010-2013 and 2014-2015 (p=0.009) compared to most recently published articles in 2016-2017 (p=0.002). Based on the number of citations, the overall mean AMSTAR score was 8 ± 1.59 for SRs with less than 10 citations, 6.29± 3.64 for SRs with citations ranging between 10 to 30 and 6± 1.22 for SRs with more than 30 citations. The association between the quality of SR and the number of citations were not statistically significant (p=0.169).

Discussion

Systematic reviews should provide the highest level of evidence for framing recommendations in clinical practice when conducted using a robust methodology. The only study that has previously analysed the quality of SRs in paediatric oral health restricted its analysis to only Cochrane SRs[13]. The authors evaluated SRs published between 2002 and 2013 and reported that the overall quality was "high". Furthermore, the authors analyzed the outcomes of the SRs and their potential application to clinical practice. Our review included all SRs published in Paediatric Dentistry journals except Cochrane reviews since they had been appraised earlier. To the best of our knowledge, this is the first study that has assessed the quality of SRs and MA published in mainstream Paediatric Dentistry journals. The study included SRs from the top five paediatric dental journals (*IJPD, PD, EAPD, EJPD* and *JCPD)* identified through Google Scholar h-5 index.

The Google Scholar h5-index rates the journals by their "visibility and influence". In addition, this provides an easy way for authors to quickly gauge the visibility and influence of recent articles in scholarly publications. Google Scholar Metrics has previously been used as a platform to identify journals[41,42]. In this review, we obtained a total of 9 journals and based on the h-5 index rating, four journals were excluded, namely Journal of Dentistry for Children (JDC), International Journal of Clinical Pediatric Dentistry (JCPD), Journal of the Korean Academy of Pediatric Dentistry (JKAPD), and Pediatric Dental Journal (PDJ).

The overall score for quality of the SRs published in the area of paediatric dentistry (7.08 from 24 studies) was very similar to those reviewed in the area of Endodontics; 7.25 and 7.13[12,42]. Kattan *et al.* analysed 36 studies which also included Cochrane reviews published in Endodontics between year 2009 to 2016 and found that the overall quality of SRs was medium[12]. In a more recent study, Nagendrababu et al. evaluated 30 articles published between 2000 to 2017 and reported a similar outcome, including using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) tool[42]. A study that looked into Cochrane and non-Cochrane SRs published in Orthodontics between 2002 and 2013 reported a relatively lower mean AMSTAR score of 6.20[10].

Evaluating the outcomes of the individual items in AMSTAR, all SRs reported on the Item 9; "methods to combine data for calculating summary measure" (item 9; 100%) followed by Item 6 on the "characteristic of the included studies" (item 6; 91.6%). Item 9 is based on the heterogeneity of findings or methods which is important to evaluate the reliability of the summary measures. Likewise, reporting the characteristics of the included studies informs the readers of the

extrapolation of the results obtained from SR and MA. While most SRs (83.3%) evaluated the scientific quality of the included studies, many SRs (70.2%) did not consider this in the conclusion or recommendations of the review. It has been emphasized that decision making based on the recommendations should be derived only from good quality studies[43]. In this study, only SRs with MA were included and we utilized the AMSTAR tool to assess methodological quality. This assigns different scores for studies with and without MA. Item 9 (methods to combine findings) and item 10 (publication bias) are applicable only to MA and articles without MA cannot be scored under these items. The difference in methodological quality of SRs with and without MA could be conducted as a separate study.

Prior registration of SRs is important as it establishes strict criteria to adhere and thereby avoid any bias that could be encountered during the reviewing process[12], as well as reducing outcome reporting bias. The International Committee of Medical Journal Editors (ICMJE) has recommended that all journals subscribing to their guidelines should require clinical trials to be registered with a pubic registry and this applies to SRs[44]. For example, PROSPERO, an international registry produced by the Centre for Reviews and Dissemination (CRD) at the University of York allows registration of prospective SRs[45]. The registered reviews are published online to help potential authors be aware of the topics that are currently under review, eliminating duplication of reviews. To add value to this, a recent study has found that the Orthodontics SRs registered with PROSPERO had 6.6% higher AMSTAR score compared to non-registered SRs[46]. Despite availability of this free public registry for registration of SRs, only 10 out of 24 articles in this review had either registered or obtained protocol approval by the Ethics Board prior to beginning the SR. Although it is desirable to register the SR in a public registry, when contacted,

two authors responded that they had obtained ethics clearance for the study[19,34]. Since this was done prior to the start of the study, it was agreed to give a score for the Q1 corresponding to "Priori" design. The presence of publication bias in a review could result from a protocol that had failed to include methods for identifying all the studies in the review. Publication bias can be identified through various methods including funnel plot and other statistical tests[47]. In the current review, we found that only 50% of SRs reported whether or not there had been any evidence of publication bias. This could severely undermine the quality of the results of the meta-analyses from those reviews.

Amongst the SRs published in the top two journals based on the Google Scholar h-5 index, the *IJPD* (h-index of 27) showed a slightly higher score of 8.33± 3.45 compared to *PD* (h- 5 index of 26) with a score of 7.20± 1.55, however the difference was not statistically significant. The mean score among other journals *(EAPD, EJPD and JCPD)* were lower (6.00 ± 2.20) compared to *IJPD* and PD journals. It is interesting to note that only *PD* journal offered guidelines on manuscript preparation to the authors of SRs[48]. The journal also indicated that only SRs following the Preferred Reporting of Systematic Reviews and Meta-Analysis (PRISMA) guideline would be considered for publication[49]. None of the other journals had this information in the "Instructions to the Authors" section. The current study showed that having at least six authors significantly improved the quality of reviews when compared to three authors and fewer. However, this trend was not observed in the orthodontics[10] and endodontics[42]. Conducting a SR requires an optimum pool of authors who serve various roles including study selection, extraction and analysis of the selected articles[50]. We categorized the authors into four groups because the range of authors in the selected SRs were between 2 to 17. Based on the time-trend analysis, SRs published in recent years

have been noted to have significantly higher quality than older SRs[10,12]. This is consistent with this study where there were significantly higher scores (8.4 ± 1.54) in the SRs published in 2016-2017 compared to those published in 2014-2015 (4.2 ± 2.28).

In our study no statistical difference was observed between the country of the first author and quality of SRs, which was similar to previous studies[10,12]. In addition to analyzing the effect of authors, journals and the year of publication to the quality of SR, we also evaluated the effect of different review topics on the overall AMSTAR score. We categorized the SRs under their most common headings; behavior management, preventive, restorative and paediatric endodontics. Only 3 articles could not be categorized in the above areas and were designated as "others"[20,22,33]. Although the quality of SRs published under the topic of restorative dentistry was higher than others, the difference was not statistically significant. It is not clear why SRs published in restorative dentistry should be of relatively superior quality to other areas; it may be partly due to the number and quality of the studies conducted in this area of research contributing to the reviews. This approach of classifying the SR based on their focus of study was not carried out in earlier studies. The association between the number of citations and the overall mean AMSTAR score must be interpreted with caution as the number of citations of a paper are likely to increase with the age of the study. In the current study, an inverse association was observed as studies with less than 10 citations had higher mean AMSTAR score (8 ± 1.59) compared to studies with more than 30 citations (6 ± 1.22). Those studies with less than 10 citations were all published between 2015 and 2017 and achieved higher AMSTAR score. The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) tool evaluates the evidence from meta-analyses based on the risk of bias, indirectness, imprecision, inconsistency of evidence and publication bias[51,52]. The

scope of this research was limited specifically to assessing the methodological quality of the SRs with MA through AMSTAR and not involve evaluation of the quality of evidence of the primary studies from which they were derived. Although this is generally considered to fall outside the scope of reviews of reviews[53], it can be recommended that further research could evaluate the quality of evidence from the SRs and MAs based on GRADE tool.

Strength and Limitations

There are several strengths to this review. Firstly, the inclusion of multiple databases in the search strategy to comprehensively identify all eligible SRs. Secondly, we did not restrict the selection criteria of SRs based on the study design (laboratory, observational, intervention) which had led to a reliable assessment of all SRs across pediatric dentistry. Thirdly, the initial evaluation of their SR was shared with the corresponding author for verification, and to identify any missing information or omissions. By doing this, we clarified some areas and obtain additional information that the authors had not presented in the SR. We only chose the top five journals based on the Google Metrics h-5 index and this review may have missed some potential articles to evaluate. We attempted to consider only mainstream Paediatric Dentistry journals and hence might not have covered all the SRs under the umbrella of "Paediatric Dentistry", for example those published in journals that were less specialized in scope. This approach, including only top journals in methodological reviews, is a common one and has been employed earlier in Medicine[54,55] as well as Dentistry in the areas of Orthodontics[10,56] and Endodontics[42]. Hence, in this study, we achieved our aim of identifying the issues relating to the quality of SRs and MA and framing recommendations based on the results. However, exclusion of studies from other journals which had publications related to the field of Paediatric Dentistry can be considered as a potential

limitation when considering generalizability of these results to the wider literature. Inclusion of studies from other journals would likely result in an overall lower quality score compared to the top five journals. Most recently, an updated version[57], AMSTAR 2 was published in September 2017 comprising of 16 items compared to 11 items of original AMSTAR[8]. The protocol of the current study selection was approved prior to the release of AMSTAR 2 and hence we did not employ the new method in our review.

Conclusions

The overall AMSTAR score of SRs and MA published in leading Paediatric Dentistry journals was 7.08 ± 2.41. The quality of the SRs and MA improved with the number of authors and the year of publication. This review identified some areas that need to be addressed by the authors of SRs and MA including: reporting of search details regardless of publication type; providing comprehensive lists of excluded studies; results of the methodological rigor and scientific quality in formulating conclusions and recommendations; and assessments of publication bias.

Why this paper is important to Paediatric Dentists

- The quality of systematic reviews and meta-analysis published in Paediatric Dentistry journals was assessed using the AMSTAR tool. This paper identifies areas for improvement that in turn will help to improve the overall quality of systematic review and meta-analysis in Paediatric Dentistry.

Legends

Figures

Fig. 1. Flowchart of the study search process.

Fig 2. Percentage score of individual items of the Systematic reviews and Meta-analyses using Assessing the Methodological Quality of Systematic Reviews (AMSTAR) as the quality assessment tool.

Tables

Table 1. Characteristics of included Systematic reviews and Meta-analyses.

Table 2. Heat map of Assessing the Methodological Quality of Systematic Reviews (AMSTAR) scores for included Systematic Reviews and Meta-Analyses.

Table 3. Assessing the Methodological Quality of Systematic Reviews (AMSTAR) scores based on characteristics of the included Systematic Reviews and Meta-Analyses.

Appendices

Appendix 1: Numbers of papers resulted from initial search.

Appendix 2: Papers excluded after reading full text.

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Table 1. Characteristics of included Systematic Reviews and Meta-Analyses.

Sl. No.	Authors	No. of authors	Country	Study design of included studies	Focus of study	No. of citations[#]	Journal	Year
1	Yengopal & Mickenautsch[16]	2	Others	Intervention	Preventive	31	EAPD	2010
2	Themessl-Huber *et al.*[17]	5	Others	Mixed*	Behaviour management	89	IJPD	2010
3	Yengopal & Mickenautsch[18]	2	Others	Intervention	Preventive	37	EAPD	2011
4	Raggio *et al.*[19]	5	South America	Intervention	Restorative	56	IJPD	2013
5	Corica & Caprioglio[20]	2	Europe	Observational	Others	14	EJPD	2014
6	Asgary *et al.*[21]	3	Others	Intervention	Paediatric Endodontics	16	JCPD	2014
7	Eichenberger *et al.*[22]	4	Europe	Intervention	Others	5	EJPD	2015
8	Li & Tanner[23]	2	North America	Intervention	Preventive	16	PD	2015
9	Borrelli *et al.*[24]	3	North America	Intervention	Behaviour management	35	PD	2015
10	Pozos-Guillen *et al.*[25]	4	North America	Intervention	Paediatric Endodontics	2	IJPD	2016
11	Botton *et al.*[26]	6	South America	Intervention	Preventive	12	IJPD	2016
12	Lenzi *et al.*[27]	6	South America	Laboratory	Restorative	8	IJPD	2016
13	Tedesco *et al.*[28]	6	South America	Mixed^	Preventive	8	IJPD	2016
14	Lin *et al.*[29]	7	Others	Intervention	Preventive	15	IJPD	2016
15	Marghalani *et al.*[30]	5	North America	Intervention	Preventive	1	PD	2016
16	Santos *et al.*[31]	6	South America	Intervention	Restorative	3	PD	2016
17	Wright *et al.*[32]	17	North America	Intervention	Preventive	29	PD	2016
18	Martens *et al.*[33]	4	Europe	Observational	Others	1	EAPD	2017
19	Cianetti *et al.*[34]	11	Europe	Mixed*	Behaviour management	2	EJPD	2017

20	Nicoloso *et al*.[35]	5	South America	Intervention	Paediatric Endodontics	9	IJPD	2017
21	Silva *et al*.[36]	9	South America	Observational	Behaviour management	6	IJPD	2017
22	Tedesco *et al*.[37]	9	South America	Intervention	Restorative	8	IJPD	2017
23	Fumes *et al*.[38]	7	South America	Laboratory	Preventive	2	JCPD	2017
24	Coll *et al*.[39]	6	North America	Intervention	Paediatric Endodontics	10	PD	2017

Table key: IJPD - International Journal of Paediatric Dentistry, EAPD - European archives of paediatric dentistry, EJPD - European journal of paediatric dentistry, PD- Pediatric Dentistry, JCPD - Journal of Clinical Pediatric Dentistry, Mixed* - Intervention and observational studies, Mixed^ - Intervention and laboratory studies, # - Number of citations based on Google Scholar Metrics

Table 2. Heat map of Assessing the Methodological Quality of Systematic Reviews (AMSTAR) scores for included Systematic Reviews and Meta-Analyses.

S.No	Authors	Item 1: Priori design	Item 2: Study selection & data extraction	Item 3: Literature search	Item 4: Publication status	Item 5: Studies list	Item 6: Characteristics of included studies	Item 7: Scientific quality of studies	Item 8: Scientific quality of studies used in conclusion	Item 9: Methods to combine findings	Item 10: Publication bias	Item 11: Conflict of interest	**Total score (out of 11)**
1	Yengopal & Mickenautsch[16]	0	1	1	1	1	1	1	0[j,k,l]	1	0	0	**7**
2	Themessl-Huber *et al.*[17]	0	0 [a,b]	1	0	0[h]	1	0	0 [j,k,l]	1	1	0	**4**
3	Yengopal & Mickenautsch[18]	0	1	0[d]	0	1	0 [i]	1	1	1	1	0	**6**
4	Raggio *et al.*[19]	1	1	0 [d,e]	0	1	0 [i]	1	0 [j,k,l]	1	0	1	**6**
5	Corica & Caprioglio[20]	0	0 [a,b,c]	0 [d,e,f]	0	0 [h]	1	0	0 [j,k,l]	1	0	0	**2**
6	Asgary *et al.*[21]	0	0 [c]	0[f]	0	0 [h]	1	1	1	1	0	0	**4**
7	Eichenberger *et al.*[22]	0	1	1	0	1	1	1	0 [j,k,l]	1	0	0	**6**
8	Li & Tanner[23]	0	0 [a,b,c]	0[f]	0	0 [h]	1	0	0 [j,k,l]	1	0	0	**2**
9	Borrelli *et al.*[24]	1	1	1	0	0 [h]	1	1	0 [j,k,l]	1	1	0	**7**
10	Pozos-Guillen *et al.*[25]	1	1	0 [d]	0	0 [h]	1	1	0 [j,k,l]	1	0	1	**6**
11	Botton *et al.*[26]	1	1	1	1	1	1	1	0 [j,k,l]	1	0	1	**9**
12	Lenzi *et al.*[27]	1	1	1	0	0 [h]	1	1	0 [j,k,l]	1	0	1	**7**
13	Tedesco *et al.*[28]	1	1	0[e,f]	0	0 [h]	1	1	1	1	1	1	**8**
14	Lin *et al.*[29]	1	0 [c]	1	1	0 [h]	1	1	0 [j,l]	1	0	1	**7**
15	Marghalani *et al.*[30]	0	1	1	1	1	1	1	1	1	1	1	**10**
16	Santos *et al.*[31]	1	1	1	1	1	1	1	1	1	1	1	**11**
17	Wright *et al.*[32]	0	1	1	1	0 [h]	1	1	1	1	1	1	**9**
18	Martens *et al.*[33]	0	1	1	1	0 [h]	1	1	0 [j,k,l]	1	1	1	**8**
19	Cianetti *et al.*[34]	1	1	1	0	1	1	0	0 [j,k,l]	1	0	0	**6**
20	Nicoloso *et al.*[35]	1	1	1	1	1	1	1	0 [j]	1	0	1	**9**
21	Silva *et al.*[36]	1	1	0 [d]	1	0 [h]	1	1	0 [j,k,l]	1	1	1	**8**
22	Tedesco *et al.*[37]	1	1	0 [d,g]	0	1	1	1	0 [j,k,l]	1	1	1	**8**
23	Fumes *et al.*[38]	1	1	1	1	0	1	1	0 [j,k,l]	1	1	1	**9**
24	Coll *et al.*[39]	1	1	1	1	1	1	1	1	1	1	1	**11**

Table key: a) did not provide information about data extractors; b) did not provide consensus procedure for disagreements; c) did not provide information about study selectors; d) literature search was not supplemented by current contents, text books, specialized register, reviews or experts in particular field; e) literature search was not performed in at least two electronic sources; f) literature search did not review from the references of included studies; g) keywords and/or MESH terms were not stated; h) list of excluded studies was not provided; i) range of characteristics of the included studies was not reported; j) results of the methodological rigor and scientific quality of included studies was not considered in the analysis; k) results of the methodological rigor and scientific quality was not considered in the conclusion; l) results of the methodological rigor and scientific quality was not considered in formulating recommendations.

Table 3. Assessing the Methodological Quality of Systematic Reviews (AMSTAR) scores based on characteristics of the included Systematic Reviews and Meta-Analyses.

Characteristics	**Sample size**	**AMSTAR[#]**			
		Q1	**Q2**	**Q3**	**Mean ± SD**
Number of authors^					
2-3	6	2.5	5	6.75	4.67 ± 2.34
4-5	7	6	6	8.5	7 ± 2.08
6-7	7	7.5	9	10	8.83 ± 1.83
>7	4	7.5	8	8.25	8 ± 1.23
					p=0.028
Name of the Country*					
South America	9	8	8	9	8.33 ± 1.41
North America	6	6.25	8	9.75	7.5 ± 3.27
Europe	4	5	6	6.5	5.5 ± 2.51
Others	5	4	6	7	5.6 ± 1.52
					p=0.056
Focus of Study*					
Behaviour Management	4	5.5	6.5	7.25	6.25 ± 1.7
Preventive	9	7	8	9	7.44 ± 2.4
Restorative	4	6.75	7.5	8.75	8 ± 2.16
Paediatric endodontics	4	5.5	7.5	9.5	7.5 ± 3.11
Others	3	4	6	7	5.33 ± 3.06
					p=0.574
Name of the Journals*					
IJPD	10	6.25	7.5	8	7.2 ± 1.55
PD	6	7.5	9.5	10.75	8.33 ± 3.45
Others	8	5.5	6	7.25	6 ± 2.20
					p=0.115
Year^					
2010 - 13	4	5.5	6	6.25	5.75 ± 1.26
2014 - 15	5	2	4	6	4.2 ± 2.28
2016 - 17	15	7.5	8	9	8.4 ± 1.54
					p=0.002

Number of Citations*					
<10	12	6.75	8	9	8 ± 1.59
11 to 30	7	3	7	8.5	6.29 ± 3.64
>30	5	6	6	7	6 ± 1.22
					p=0.169

Table key: IJPD - International Journal of Paediatric Dentistry; PD - Paediatric Dentistry; Q1-first quartile, Q2-second quartile, Q3-third quartile; [#]Statistical analysis based on median scores using Kruskal-Wallis Test; *No statistical difference in methodological quality based on country, focus of study, journals and number of citations, [^]Statistical difference observed; Mann-Whitney U test between number of authors (2-3 vs 4-5 p=0.009; 2-3 vs 6-7 p= 0.005); 2-3 vs >7 p=0.017) and year (2010-13 vs 2016-17 p=0.009; 2014-15 vs 2016-17 p=0.002).

Identification

Screening

Eligibility

Included

Records identified through database searching
(n=3004)

Records after duplicates removed
(n =2283)

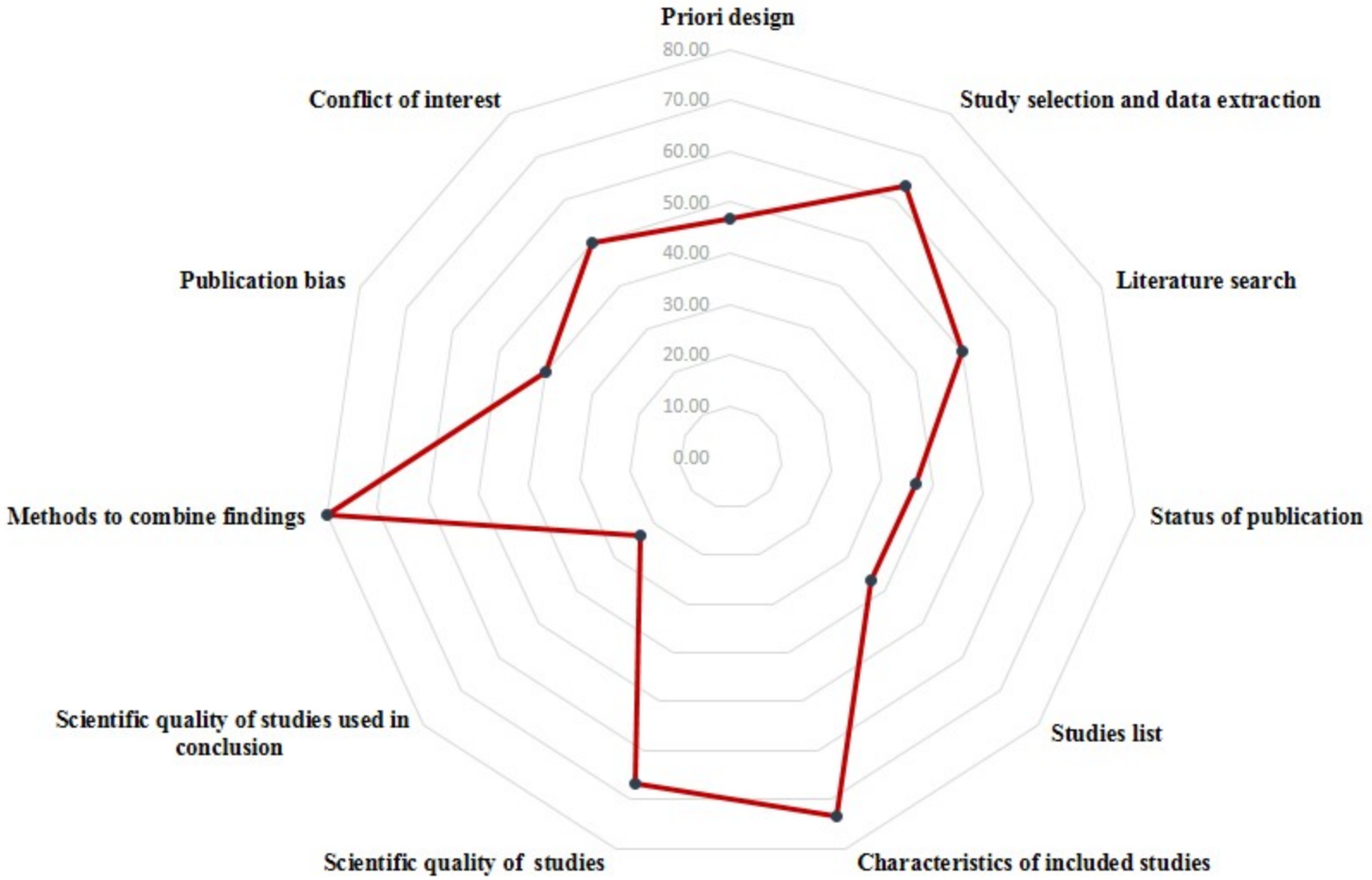
Records screened
(n = 2283)

Records excluded
(n = 2231)

Full-text articles assessed for eligibility
(n =52)

Full-text articles excluded, with reasons
(n = 28)

Studies included in qualitative synthesis
(n = 24)


Priori design
Study selection and data extraction
Literature search
Status of publication
Studies list
Characteristics of included studies
Scientific quality of studies
Scientific quality of studies used in conclusion
Methods to combine findings
Publication bias
Conflict of interest
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00

Appendix 1. Number of papers resulted from initial search.

Sl. No.	Search terms	PubMed	Scopus
1	(“Int J Paediatr Dent”) AND ((systematic review) OR Meta-analysis)	123	396
2	(“Eur J Paediatr Dent”) AND ((systematic review) OR Meta-analysis)	44	195
3	(“J Clin Pediatr Dent”) AND ((systematic review) OR Meta-analysis)	168	301
4	(“Eur Arch Paediatr Dent”) AND ((systematic review) OR Meta-analysis)	70	203
5	(“Pediatr Dent”) AND ((systematic review) OR Meta-analysis)	373	1131

Appendix 2. Excluded papers after reading full text.

1. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Aiem%20E%5BAuthor%5D&cauthor=true&cauthor_uid=27532506" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Sma%C3%AFl-Faugeron%20V%5BAuthor%5D&cauthor=true&cauthor_uid=27532506" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Muller-Bolla%20M%5BAuthor%5D&cauthor=true&cauthor_uid=27532506" **}**. Aesthetic preformed paediatric crowns: systematic review. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/27532506" \o "International journal of paediatric dentistry." ***}*** 2017; **27**: 273-282.

2. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Knapp%20R%5BAuthor%5D&cauthor=true&cauthor_uid=27531644" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Gilchrist%20F%5BAuthor%5D&cauthor=true&cauthor_uid=27531644" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Rodd%20HD%5BAuthor%5D&cauthor=true&cauthor_uid=27531644" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Marshman%20Z%5BAuthor%5D&cauthor=true&cauthor_uid=27531644" **}**. Change in children's oral health-related quality of life following dental treatment under general anaesthesia for the management of dental caries: a systematic review. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/27531644" \o "International journal of paediatric dentistry." ***}*** 2017; **27**: 302-312.

3. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Americano%20GC%5BAuthor%5D&cauthor=true&cauthor_uid=27098755" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Jacobsen%20PE%5BAuthor%5D&cauthor=true&cauthor_uid=27098755" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Soviero%20VM%5BAuthor%5D&cauthor=true&cauthor_uid=27098755" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Haubek%20D%5BAuthor%5D&cauthor=true&cauthor_uid=27098755" **}**. A systematic review on the association between molar incisor hypomineralization and dental caries. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/27098755" \o "International journal of paediatric dentistry." ***}*** 2017; **27**: 11-21.

4. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Moreira%20MJ%5BAuthor%5D&cauthor=true&cauthor_uid=26538473" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Schwertner%20C%5BAuthor%5D&cauthor=true&cauthor_uid=26538473" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Jardim%20JJ%5BAuthor%5D&cauthor=true&cauthor_uid=26538473" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Hashizume%20LN%5BAuthor%5D&cauthor=true&cauthor_uid=26538473" **}**. Dental caries in individuals with Down syndrome:

a systematic review. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/26538473" \o "International journal of paediatric dentistry." } 2016; **26**: 3-12.

5. Papineni McIntosh A, Ashley PF, Lourenco-Matharu L. Reported side effects of intravenous midazolam sedation when used in paediatric dentistry: a review. *Int J Paediatr Dent* 2015; **25**: 153-64.

6. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Martins-J%C3%BAnior%20PA%5BAuthor%5D&cauthor=true&cauthor_uid=24205851" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Franco%20FA%5BAuthor%5D&cauthor=true&cauthor_uid=24205851" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=de%20Barcelos%20RV%5BAuthor%5D&cauthor=true&cauthor_uid=24205851" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Marques%20LS%5BAuthor%5D&cauthor=true&cauthor_uid=24205851" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Ramos-Jorge%20ML%5BAuthor%5D&cauthor=true&cauthor_uid=24205851" }. Replantation of avulsed primary teeth: a systematic review. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/24205851" \o "International journal of paediatric dentistry." } 2014; **24**: 77-83.

7. Papineni A, Lourenco-Matharu L, Ashley PF. Safety of oral midazolam sedation use in paediatric dentistry: a review. *Int J Paediatr Dent* 2014; **24**: 2-13.

8. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Chi%20DL%5BAuthor%5D&cauthor=true&cauthor_uid=23758751" }. Dental caries prevalence in children and adolescents with cystic fibrosis: a qualitative systematic review and recommendations for future research. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/23758751" \o "International journal of paediatric dentistry." } 2013; **23**: 376-386.

9. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=De%20Coster%20P%5BAuthor%5D&cauthor=true&cauthor_uid=23171469" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Rajasekharan%20S%5BAuthor%5D&cauthor=true&cauthor_uid=23171469" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Martens%20L%5BAuthor%5D&cauthor=true&cauthor_uid=23171469" }. Laser-assisted pulpotomy in primary teeth: a systematic review. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/23171469" \o "International journal of paediatric dentistry." } 2013; **23**: 389-399.

10. { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Leong%20PM%5BAuthor%5D&cauthor=true&cauthor_uid=22925469" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Gussy%20MG%5BAuthor%5D&cauthor=true&cauthor_uid=22925469" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Barrow%20SY%5BAuthor%5D&cauthor=true&cauthor_uid=22925469" }, { HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=de%20Silva-Sanigorski%20A%5BAuthor%5D&cauthor=true&cauthor_uid=22925469" }, { HYPERLINK

"https://www.ncbi.nlm.nih.gov/pubmed/?term=Waters%20E%5BAuthor%5D&cauthor=true&cauthor_uid=22925469" **}**. A systematic review of risk factors during first year of life for early childhood caries. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/22925469" \o "International journal of paediatric dentistry." ***}*** 2013; **23**: 235-250.

11. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Hassl%C3%B6f%20P%5BAuthor%5D&cauthor=true&cauthor_uid=17683319" **}**, **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/?term=Twetman%20S%5BAuthor%5D&cauthor=true&cauthor_uid=17683319" **}**. Caries prevalence in children with cleft lip and palate--a systematic review of case-control studies. **{** HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/17683319" \o "International journal of paediatric dentistry." ***}*** 2007; **17**: 313-319.

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